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(71) Applicants

Provesan S.A., 1, Place
 St. Gervais, 1211
 Geneva, Switzerland

(72) Inventor

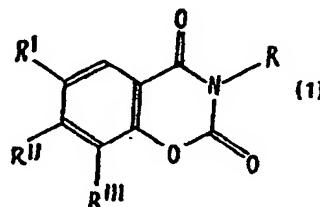
Antonio Esteve-Subirana

(74) Agents

Reddie & Grose

(54) New derivatives of 1,3-benzoxazine-2,4-dione, their preparation and their application as medicaments

(57) The invention concerns 1,3-benzoxazine-2,4-dione derivatives of the formula



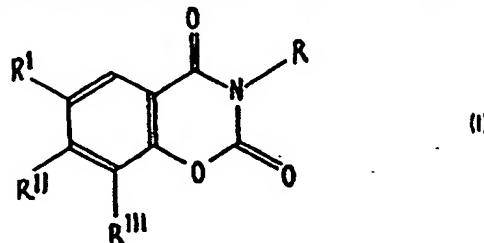
In which R represents an alkyl radical, an *ortho*-phenoxy-phenyl, *ortho*-thiophenoxy-phenyl, a benzyl, furfuryl or 2-pyridyl group; R' represents a hydrogen, chlorine, or bromine atom or a methoxy radical; R'' represents a hydrogen or chlorine atom or a methyl radical; and R''' represents a hydrogen, chlorine or bromine atom. R preferably represents a C₁ to C₄ alkyl radical. The derivatives of the invention have pharmacological (e.g. analgesic and anti-inflammatory) activity and may be administered in tablet, capsule, suppository and the like forms. Methods for the preparation of these derivatives are disclosed.

SPECIFICATION

New derivatives of 1,3-benzoxazine-2,4-dione, their preparation and their application as medicaments

The present invention provides new derivatives of 1,3-benzoxazine-2,4-dione, their preparation
5 and their application as medicaments.

The new derivatives of the present invention, have with the general formula I

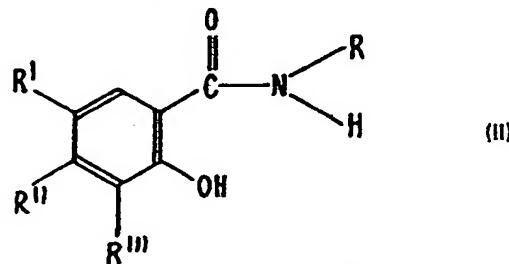


in which R represents an alkyl radical, especially a lower alkyl radical preferably with C₁ to C₄, an ortho-phenoxy-phenyl, ortho-thiophenoxy-phenyl, a benzyl, furfuryl or a 2-pyridyl group;

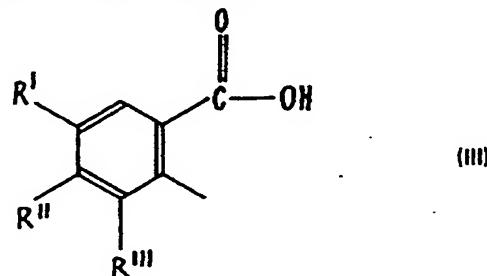
- 10 R' represents a hydrogen, chlorine, or bromine atom or a methoxyl radical;
R'' represents a hydrogen or chlorine atom or a methyl radical; and
R''' represents a hydrogen, chlorine or bromine atom.

The derivatives of general formula I have proved to possess valuable pharmacological properties.
The present invention therefore also relates to the application of these compounds as medicaments as
15 well as to pharmaceutical compositions containing them as active ingredient.

The present invention also relates to the preparation of derivatives of general formula I. According to the invention, these derivatives of general formula I are obtained:
a) by reaction of a derivative of salicylamide of general formula II



- 20 In which R, R', R'' and R''' have the meanings indicated in connection with general formula I, with ethyl chlorocarbonate; or
b) by reaction of a derivative of salicylic acid of general formula III



- In which R', R'' and R''' have the meaning indicated in connection with general formula I, with an
25 isocyanate of general formula IV



in which R has the meaning given in connection with general formula I.

By way of simple non-limiting examples, the preparation of a few derivatives of general formula I will hereinafter be described in more detail.

EXAMPLE 1***Preparation of 6-chloro-3-methyl-1, 3-benzoxazine-2, 4-dione***

37 ml (0.375 mole) of ethyl chlorocarbonate is added slowly (1/2 hour) to a solution of 18.6 g (0.1 mole) of 5-chloro-N-methylsalicylamide in pyridine. It is allowed to reflux for 7 hours, allowed to cool, is 5 diluted with water, filtered and washed with distilled water. It is recrystallised from chloroform, washed with methanol at 5°C and 6-chloro-3-methyl-1, 3-benzoxazine-2, 4-dione with melting point 161—153°C (see Table I) is obtained.

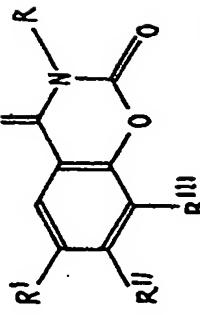
EXAMPLE 2***Preparation of 6-bromo-3-methyl-1, 3-benzoxazine-2, 4-dione***

10 7.5 ml (0.12 mole) of methyl isocyanate and 5 ml of triethylamine are added to a solution of 21.7 g (0.1 mole) of 5-bromosalicylic acid in 150 ml of benzene. The mixture is stirred for 1 hour at ambient temperature and then allowed to reflux for 6 hours. It is evaporated to dryness, recrystallised from methanol and 6-bromo-3-methyl-1,3-benzoxazine-2,4-dione with melting point 186°C (see Table I) is obtained.

15 EXAMPLES 3 TO 17

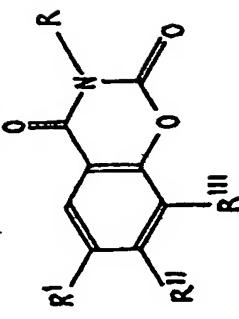
By operating as described in Examples 1 and 2 various derivatives were obtained, a number of the physio-chemical constants of which, such as the crystallisation solvents, the melting points and the characteristic bands of the Infra-red spectrum are indicated in Table I hereinafter.

TABLE I



Ex. No.	R	R'	R''	R'''	Melting Point	Crystalliza- tion Solvent	Yield %	IR (cm ⁻¹)	ANALYSIS				
									C	H	Cl	Br	N
1	CH ₃	Cl	H	161-3	CHCl ₃	93	1300, 1360 1690, 1770	Calcd. Found	51.12 51.20	2.88 2.78	16.76 16.70	—	6.63 6.57
2	CH ₃	Br	H	188	CH ₃ OH	19	1300, 1350 1690, 1750	Calcd. Found	42.23 42.15	2.38 2.41	—	31.14 31.27	5.47 5.32
3	CH ₃ CH ₂ CH ₃	Cl	H	118	CH ₃ OH	52	1340 1700, 1770	Calcd. Found	56.17 55.25	4.21 4.15	14.80 14.73	—	5.85 5.97
4	CH(CH ₃) ₃	Cl	H	167-8	CH ₃ OH	24	1330 1700, 1770	Calcd. Found	55.17 55.08	4.21 4.32	14.80 14.86	—	5.85 5.80
5	CH ₃ CH ₂ CH ₂ CH ₃	Cl	H	103	CH ₃ CH ₂ OH	12	1300 1700, 1770	Calcd. Found	66.87 66.79	4.76 4.81	14.00 13.92	—	5.52 5.48
6	(CH ₂) ₁₀ CH ₃	Cl	H	97	CH ₃ COCH ₃	67	1350 1700, 1770	Calcd. Found	68.31 68.42	8.60 8.56	8.40 8.35	—	3.32 3.25
7	CH ₂ -C ₆ H ₄	Cl	H	152-5	CH ₃ OH	42	1340 1710, 1770	Calcd. Found	62.80 62.65	3.51 3.57	12.33 12.28	—	4.87 4.97
8	CH ₂ -C ₆ H ₄ O	Cl	H	178-80	EtOH/Me ₂ CO	46	1320 1700, 1770	Calcd. Found	56.27 56.14	2.80 2.87	12.77 12.69	—	5.05 4.98
9	CH ₂ -C ₆ H ₄ O-C ₆ H ₅	Cl	H	187	EtOH	70	1360 1710, 1770	Calcd. Found	65.73 65.61	3.30 3.34	9.70 9.77	—	3.83 3.95

TABLE I (continued)



Ex. No.	R	R'	R''	R'''	Melting Point	Crystalliza- tion Solvent	Yield %	IR (cm ⁻¹)	ANALYSIS					
									C	H	Cl	Br	N	
10		.Cl	H	H	150	EtOH	98	1380 1710, 1770	Calcd. Found	62,80 63,02	3,17 3,08	9,29 9,34	- -	3,67 3,80
11	CH ₃	H	Cl	H	192-4	CH ₃ OH	10	1300, 1380 1690, 1780	Calcd. Found	51,11 50,88	2,88 2,93	16,78 16,89	- -	6,62 6,63
12	CH ₃ CH ₃	Cl	H	H	120-2	C Cl ₄	51	1340, 1360 1700, 1770	Calcd. Found	63,27 63,15	3,68 3,63	16,72 16,74	- -	6,22 6,15
13	CH ₃	Cl	H	Cl	159-63	AcOEt	6	1300, 1380 1690, 1770	Calcd. Found	43,84 44,05	2,05 1,98	28,82 28,91	- -	5,69 5,75
14	CH ₃ CH ₃ CH ₂ CH ₃	Cl	H	Cl	106-8	CH ₃ OH	46	1340 1700, 1770	Calcd. Found	50,00 49,87	3,88 3,91	24,61 24,57	- -	4,88 4,79
15	CH ₃ CH ₂ CH ₂ CH ₃	Br	H	Br	139	EtOH	38	1350 1690, 1770	Calcd. Found	38,23 38,32	2,94 3,01	- -	42,39 42,53	3,72 3,77
16	CH ₃ O	H	H	H	138-40	CH ₃ OH/H ₂ O	23	1300, 1355 1690, 1780	Calcd. Found	58,02 57,91	4,38 4,42	- -	- -	6,77 6,85
17	CH ₃	H	CH ₃	H	164	CH ₃ OH	12	1300, 1370 1690, 1780	Calcd. Found	62,89 62,87	4,75 4,70	- -	- -	7,33 7,40

Analgesic activity

The analgesic activity of the derivatives of general formula I has been determined using male mice of weight between 20 and 25 g. The product to be tested is administered orally in suspension in 5 % gum arabic by means of an oesophageal probe. The volume of the solution administered is 25 ml/kg and 5 the concentration of the tested product is changed according to the dose administered.

- Pain is caused in the animals by an intraperitoneal injection of 0.2 ml/20g solution of acetylcholine bromide with a concentration of 0.32 ml/ml. Five minutes before the administration of the tested product, the acetylcholine is injected into a batch of 5 mice. The product to be tested is then administered and the injection of acetylcholine is administered again after 20, 40, 80, 120 and 160 10 minutes. The number of contortions per injection of acetylcholine is always counted for 5 minutes.

The analgesic activity is calculated by means of the following formula:

$$It = 100 - \frac{Nt}{No} \cdot 100 = 100 \left(1 - \frac{Nt}{No} \right)$$

where

It = inhibition of the pain after t minutes

- 15 No = number of contortions before the administration of the product

Nt = number of contortions after t minutes from the administration of the product.

Several doses of each product are administered so that the fifty per cent analgesic dose (AD—50) can be determined.

- With each of these doses It is calculated for times of 20, 40, 80, 120 and 160 minutes. The mean 20 of these five values of It for each dose is taken as the analgesic effect. The analgesic effects are represented graphically as a function of the logarithm of the corresponding dose.

From this curve the analgesic dose fifty, that is to say, the dose which produces a fifty per cent analgesic effect, is obtained.

- By way of example, the results obtained for a few derivatives of formula I according to the invention 25 have been indicated in Table II hereinafter.

Acute toxicity

The acute toxicity is determined orally with mice of 20 to 25 g weight, by using batches of 6 animals. Several doses in geometric progression are administered. The time of observation is 72 hours. The fifty per cent lethal dose (LD—50) is calculated graphically by means of logarithmic-probabilistic 30 paper.

By way of example, the results obtained for a few derivatives of formula I according to the invention are indicated in Table II hereinafter.

TABLE II

Example No.	Derivative:	Doses in mg/kg	
		AD-50	LD-50
1	6-chloro-3-methyl-1,3-benzoxazine-2,4-dione	30	233
2	6-bromo-3-methyl-1,3-benzoxazine-2,4-dione	90	717
3	6-chloro-3-propyl-1,3-benzoxazine-2,4-dione	240	>650
8	6-chloro-3-furyl-1,3-benzoxazine-2,4-dione	280	>550
9	6-chloro-3-(O-phenoxyphenyl)-1,3-benzoxazine-2,4-dione	675	>750
10	6-chloro-3-(O-thiophenoxy-phenyl)-1,3-benzoxazine-2,4-dione	650	>1500
12	6-chloro-3-ethyl-1,3-benzoxazine-2,4-dione	172	>250

Anti-inflammatory activity

The anti-inflammatory activity in the male rat of Sprague-Dawley stock is determined. An oedema is caused in the paw by subplantar injection of a 1 % solution of carragheenin. The volume of the paw is measured before the oral administration of the product after two and five hours with a plethysmometer.

5 The anti-inflammatory activity is calculated with respect to a reference batch. By way of example, the results obtained for the derivative of example I are indicated in Table III. 5

TABLE III

Example	Derivative	Dose (mg/kg)	Anti-Inflammatory Activity	
			2 hours	5 hours
1	6-chloro-3-methyl-1,3-benzoxazine-2,4-dione	100	26%	30%

Taking into account their good pharmacodynamic properties, the derivatives of general formula I are hence capable of being used as veterinary and/or human medicine, as analgesic, antipyretic and 10 anti-inflammatory agents. 10

Pharmaceutical compositions which contain, according to the invention, besides an acceptable pharmaceutical support, at least one derivative of general formula I have a very large field of therapeutic application and can be utilised especially in traumatology, surgery, rheumatology, odontostomatology, oto-rhino-laryngology, pneumology, cardiology, gynaecology and urology. These pharmaceutical 15 compositions will be, for example, utilised for the treatment of various manifestations of pain, headaches, migraines, toothache, neuralgias, menstrual pains, inflammatory rheumatisms, arthritis pains, feverish states, colds, influenzas and seasonal infections. 15

In human therapy, the dose proposed for the derivatives of the present invention is approximately between 100 and 300 mg/day, administered for example in the form of tablets, capsules or 20 suppositories. 20

Hereinafter, by way of example, three particular galenic forms of the derivatives, the objects of the present invention, will be indicated. 20

Example of formula per tablet

25	6-chloro-3-methyl-1,3-benzoxazine-2,4-dione	100 mg	
	Avicel pH—102	100 mg	
	Primojet	10 mg	
	Aerosil—200	1 mg	
	Magnesium stearate	2 mg	
			Tablet weight
			213 mg

Example of formula per capsule

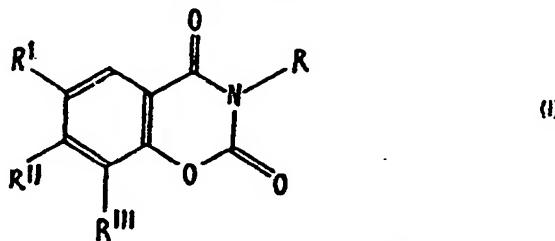
30	6-chloro-3-methyl-1,3-benzoxazine-2,4-dione	100 mg	
	Lactose	75 mg	
	Avicel pH—102	25 mg	
	Aerosil—200	1 mg	
	Magnesium stearate	2 mg	
			Capsule weight
			203 mg

Example of formula per suppository

35	6-chloro-3-methyl-1,3-benzoxazine-2,4-dione	0.2 g	
	Monolene	1.8 g	
			Suppository weight
			2.0 g

CLAIMS

1. A derivative of 1,3-benzoxazine-2,4-dione of the general formula

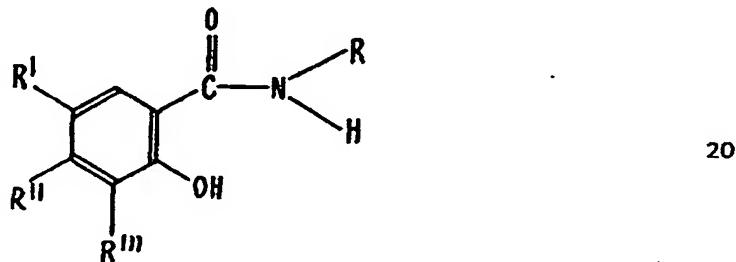


in which R represents an alkyl radical, an ortho-phenoxy-phenyl, ortho-thiophenoxy-phenyl, a benzyl, furfuryl or 2-pyridyl group; R' represents a hydrogen, chlorine, or bromine atom or a methoxy radical; R'' represents a hydrogen or chlorine atom or a methyl radical; and R''' represents a hydrogen, chlorine or bromine atom.

- 5 2. A derivative as claimed in claim 1 wherein R represents a lower alkyl radical.
3. A derivative as claimed in claim 1 wherein R represents an alkyl radical with 1 to 4 carbon atoms.

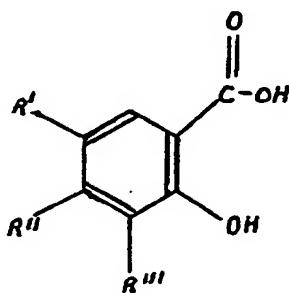
- 10 4. 6-chloro-3-methyl-1,3-benzoxazine-2,4-dione.
5. 6-chloro-3-ethyl-1,3-benzoxazine-2,4-dione.
6. 6-chloro-3-propyl-1,3-benzoxazine-2,4-dione.
7. 6-chloro-3-furfuryl-1,3-benzoxazine-2,4-dione.
15 8. 6-chloro-3-(o-phenoxyphenyl)-1,3-benzoxazine-2,4-dione.
9. 6-chloro-3-(o-thiophenoxyphenyl)-1,3-benzoxazine-2,4-dione.
10. 6-bromo-3-methyl-1,3-benzoxazine-2,4-dione.

11. A method of preparation of a derivative as claimed in claim 1, wherein a derivative of salicylamide of the general formula



in which R, R', R'' and R''' have the meaning indicated in claim 1 is reacted with ethyl chlorocarbonate.

12. A method of preparation of a derivative as claimed in claim 1, wherein a derivative of salicylic acid of the general formula



- 25 25 in which R', R'' and R''' have the meaning indicated in claim 1, is reacted with an isocyanate of general formula



in which R has the meaning given in claim 1.

13. A method as claimed in claim 14, conducted substantially as described in Example 1.
30 14. A method as claimed in claim 15, conducted substantially as described in Example 2.

15. A pharmaceutical composition comprising a compound as claimed in any one of claims 1 to 13 together with a pharmaceutically acceptable carrier.
16. A pharmaceutical composition as claimed in claim 19 in the form of a tablet, capsule or suppository.
- 5 17. A pharmaceutical composition as claimed in claim 19 substantially as described in the Examples herein.

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